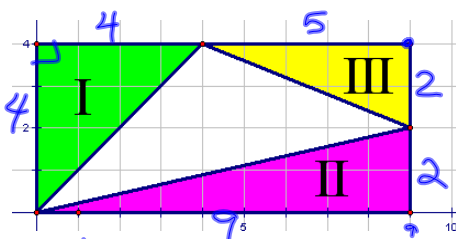
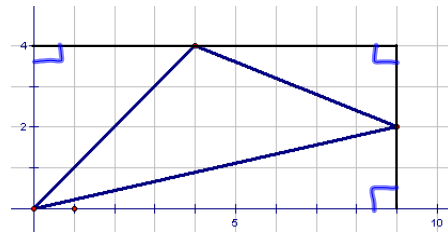
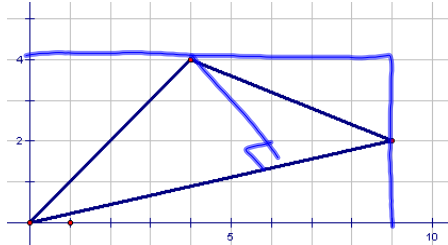
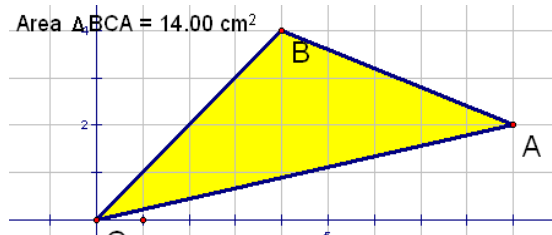


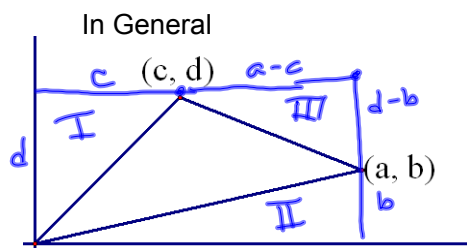
Area by Determinants



$$\begin{aligned}
 A_{\text{rect}} &= A_I + A_{II} + A_{III} \\
 9 \cdot 4 &= \frac{1}{2} \cdot 4 \cdot 4 + \frac{1}{2} \cdot 9 \cdot 2 + \frac{1}{2} \cdot 5 \cdot 2 \\
 36 &= 8 + 9 + 5 \\
 A &= 14 \text{ units}^2
 \end{aligned}$$



Area $\triangle BCA = 14.00 \text{ cm}^2$



$$A_R = A_I + A_{II} + A_{III}$$

$$ad = \frac{1}{2}cd + \frac{1}{2}ab + \frac{1}{2}(a-c)(d-b)$$

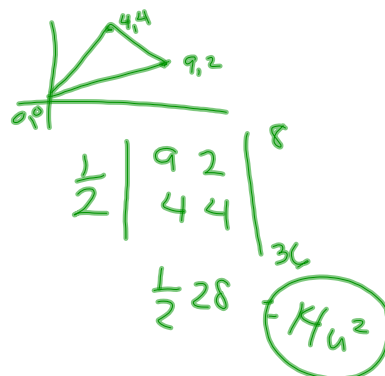
$$ad = \frac{1}{2}cd + \frac{1}{2}ab + \frac{1}{2}(ad - bd - cd + bc)$$

$$\cancel{ad} - \frac{1}{2}cd - \frac{1}{2}ab - \frac{1}{2}ad + \frac{1}{2}ab + \frac{1}{2}cd - \frac{1}{2}bc$$

$$\frac{1}{2}ad - \frac{1}{2}bc$$

$$\frac{1}{2}(ad - bc)$$

$$\frac{1}{2} \begin{vmatrix} a & b \\ c & d \end{vmatrix} = \frac{1}{2}(ad - bc)$$



Example:
Find the area
(0, 0), (5, 2), (4, 6)

$$\frac{1}{2} \begin{vmatrix} 5 & 2 \\ 4 & 6 \end{vmatrix} = \frac{1}{2} (30 - 8) = \frac{1}{2} (22) = 11 u^2$$

Area of Δ
Using Determinants

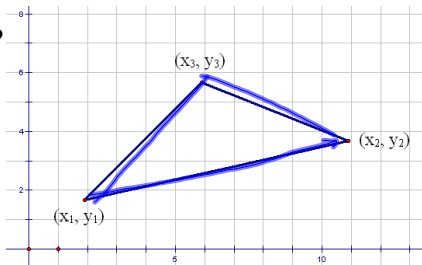
$$\frac{1}{2} \begin{vmatrix} a & b \\ c & d \end{vmatrix}$$

$$\frac{1}{2} \begin{vmatrix} 4 & 6 \\ 9 & 2 \end{vmatrix} = \frac{1}{2} (-22) = -11 u^2$$

Do:
Find the area.
(0, 0), (5, -3), (-10, 9)

$$A = 7.5 u^2$$

What if...?




$$\frac{1}{2} \left[\begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix} + \begin{vmatrix} x_2 & y_2 \\ x_3 & y_3 \end{vmatrix} + \begin{vmatrix} x_3 & y_3 \\ x_1 & y_1 \end{vmatrix} \right]$$

Ex:

Find the area:

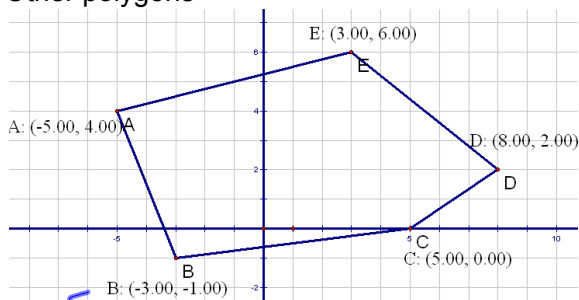
(3, 8) (5, 1) (-1, 2)



$$\frac{1}{2} \left[\begin{vmatrix} 3 & 8 \\ 5 & 1 \end{vmatrix} + \begin{vmatrix} 5 & 1 \\ -1 & 2 \end{vmatrix} + \begin{vmatrix} -1 & 2 \\ 3 & 8 \end{vmatrix} \right]$$

$\begin{matrix} -37 & 11 & -14 \end{matrix}$
 $\begin{matrix} \frac{1}{2} & -40 & -20 \end{matrix}$
 20 units^2

Other polygons



$$= \frac{1}{2} \left[\begin{vmatrix} -5 & 4 \\ -3 & -1 \end{vmatrix} + \begin{vmatrix} -3 & -1 \\ 5 & 0 \end{vmatrix} + \begin{vmatrix} 5 & 0 \\ 8 & 2 \end{vmatrix} + \begin{vmatrix} 8 & 2 \\ 3 & 6 \end{vmatrix} + \begin{vmatrix} 3 & 6 \\ -5 & 4 \end{vmatrix} \right]$$

$\begin{matrix} 17 & 5 & 10 & 42 & 42 \end{matrix}$
 $\frac{1}{2} 116$
 58 u^2